PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in and relating to Exhaust Gas Turbines

We, PRVNI BRNENSKA STROJIRNA, ZAVODY KLEMENTA GOTTWALDA, NARODNI PODNIK, a Czechoslovakian Company, of No. 7, Olomoucka, Brno, Czechoslovakia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to exhaust gas turbines for driving blowers for supercharged internal-combustion engines. Good coordination of the performance characteristics of the blower with the performance characteristics of the turbine is an indispensable condition for obtaining the desired increase of power output of a super-charged Diesel engine at an optimum specific fuel consumption.

When designing the blower for the required power output increase of a Diesel engine the parameters thereof are determined only approximately by calculation, the adjustment of the characteristics being accomplished directly during the tests with the Diesel engine. When carrying out the adjustment it is usually necessary to vary the supercharging pressure as well as the volume of air to be delivered, which is performed by varying the speed of rotation of the exhaust gas turbine driving the blower. The speeds of the turbine vary either owing to the variation of the free or effective nozzle area of the turbine or owing to the variation of the outlet angle of the nozzle ring blades. In mass-production of supercharging turbo-blowers, where the nozzle rings are manufactured by casting into cast-iron rings, it is, however, not possible to carry out the modification of the effective nozzle area by varying the height of the blades. This would entail an excessive number of patterns. The modification must thus be carried out in a different way, so that the smallest possible number of patterns is sufficient.

Methods of adjustment of the cross section of guide blades are known, where, in blades having a curved camber line, their width is varied by their turning off along their whole length, whereby the outlet cross section is increased. The curvature of such blades must continuously vary and it is therefore not possible to form the camber line of the blades by one or two circular arcs, since there would then be a discontinuity in the curvature. Such a blade is rather difficult to produce. It is therefore advantageous to employ blades where the camber line is constituted by an arc of radius r and by its tangent, which follows the direction of the outlet velocity from the nozzle ring, as shown in Figure 1 of the accompanying drawing. If the guide blades form an outlet portion of constant width m, it is not possible to obtain by uniform machining off along their whole length a modification of the outlet cross section and hence a substantial change in the peripheral velocity of the moving blades.

The said drawbacks in the manufacture of an exhaust gas turbine driving a blower are removed by the nozzle ring according to the invention, which provides that the outlet end edges of the blades of the nozzle ring of the turbine are conically machined off in such a way that the width of the blades is greater near the outer support ring than near the inner support ring. By this means modification of the outlet angle from the guide blades is attained, whereby the peripheral component of the outlet velocity from the nozzle ring of the turbine and hence also the peripheral velocity of the moving blades is changed. In so far as there is no question of a considerable variation of the axial clearance between the guide and moving blades—if the profile of the rotating blades adopted is able to work well within a wide range of guide blade angles the efficiency of the turbine is not substantially changed.

[*Price* 4s. 6d.]

A specific embodiment of the invention is represented by way of example in the accompanying drawing, in which:—

Figure 1 diagrammatically represents the guide blades;

Figure 2 shows the overall modification of the blades, and

Figure 3 shows the partial modification of the blades.

The guide blades 1 are cast in the support rings 2, 3. The original shape, represented in dash lines in Figures 2 and 3, will be machined off along the straight line *a*—*b* (Figure 2), so that the width of the blades 1 is greater near the outer support ring 2 than near the inner support ring 3.

Owing to this machining off the ratio *s*:*c* (Figure 1) where *s* is the pitch and *c* the chord, which is a function of the outlet angle from the blades, is greater on the inner radius than on the outer radius. The blade 1 can be machined off along the whole length, as shown in Figure 2, or along a part thereof, as shown in Figure 3.

WHAT WE CLAIM IS:—

1. A method for the modification of the nozzle ring of an exhaust gas turbine driving a blower for supercharged internal combustion engines, characterised in that outlet end edge of the blades of the nozzle ring of the turbine are conically machined off in such a way that the width of the blades is greater near the outer support ring than near the inner support ring.

2. A method of modification as claimed in Claim 1, characterized in that the conical machining off is performed along only a portion of outer end edge of the blade.

3. A method for the modification of exhaust gas turbine guide vanes substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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916672 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1.

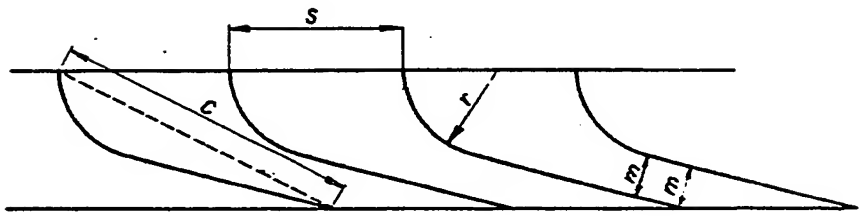

FIG. 2.

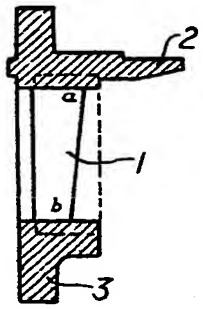

FIG. 3.